

WHAT IS CLAIMED IS:

1. A method for vehicle to vehicle communication among a plurality of vehicles having wireless communication links, comprising:

- receiving notification of a priority message communication, wherein said priority message communication concerns a sudden change in vehicle behavior;

- broadcasting not less than one priority message communication to surrounding vehicles within a transmission range if said notifying vehicle is experiencing said sudden change in vehicle behavior;

- determining whether said sudden change in vehicle behavior comprises an emergency event, wherein said emergency event includes creating a potential hazard to other vehicles;

- discontinuing broadcasting of said priority message to said surrounding vehicles if said sudden change in vehicle behavior does not comprise an emergency event;

- defining a repeat cycle, wherein said repeat cycle comprises the frequency with which said priority message is re-broadcast;

- defining a maximum number of initial repetitions for said priority message;

- pausing for variable time intervals between each transmission of said priority message;

- determining whether said maximum number of repetitions has been reached;

- repeating broadcasting said priority message and pausing between each said transmission until said maximum number of repetitions has been reached; and

- electing a leader vehicle, wherein said leader vehicle is the primary transmitting vehicle in a series of vehicles reacting to said emergency event.

2. The method for vehicle to vehicle communication according to claim 1, wherein determining whether said notifying vehicle is in an emergency status comprises detecting sensor measurements from said notifying vehicle.

3. The method for vehicle to vehicle communication according to claim 1, wherein said repeat cycle comprises an optimum repeating period for said priority message.

4. The method for vehicle to vehicle communication according to claim 3, wherein said optimum repeating period includes increasing said repeating period with time up to a predetermined limit.

5. The method for vehicle to vehicle communication according to claim 1, wherein electing a leader vehicle comprises:

determining whether said priority message has been received within leader regain time, wherein said leader regain time is derived from the transmission range and the maximum speed of the vehicles;

identifying the sender of said priority message;

determining the location of said sender;

broadcasting said priority message if said sender is not located behind a receiver or if said priority message has not been received within leader regain time; and

repeating determining whether said priority message has been received within leader regain time if said sender is located behind said receiver.

6. The method for vehicle to vehicle communication according to claim 1, further comprising transfer of vehicle leadership.

7. The method for vehicle to vehicle communication according to claim 6, wherein leadership transfer comprises:

receiving notice that a following vehicle has become a leader vehicle, wherein said leader vehicle comprises the lead vehicle for an emergency event within the transmission range for said event; and

transferring leadership if the current time less the time at which said priority message was initiated is larger than the minimum time for which said priority message may be repeated.

8. The method for vehicle to vehicle communication according to claim 1, further comprising regaining leadership.

9. The method for vehicle to vehicle communication according to claim 8, wherein regaining leadership comprises:

receiving no said priority message within said leader regain time; and  
transmitting said priority message.

10. The method for vehicle to vehicle communication according to claim 1, further comprising identifying priority message forwarding vehicles.

11. The method for vehicle to vehicle communication according to claim 10, wherein identifying said message forwarding vehicles comprises defining an impact zone, wherein said impact zone includes those vehicles that may be impacted by said emergency event.

12. The method for vehicle to vehicle communication according to claim 11, wherein said impact zone is defined according to not less than one of location, speed, acceleration/deceleration, or moving direction of the vehicle experiencing said emergency event.

13. The method for vehicle to vehicle communication according to claim 11, wherein said impact zone includes an alert zone and a warning zone, wherein said alert zone includes vehicles within one communications radius from said leader vehicle, and wherein

said warning zone includes vehicles outside of said alert zone but within two communications radii from said leader vehicle.

14. The method for vehicle to vehicle communication according to claim 13, wherein said impact zone is included within a motion-cast region.

15. The method for vehicle to vehicle communication according to claim 13, wherein forwarding said priority message within said alert zone comprises:

receiving said priority message;

determining the relevance of said priority message, wherein relevance is based on membership in said impact zone;

notifying the driver of the receiving vehicle if said priority message is relevant;

pausing for a random duration and listening for other forwarded priority messages if said priority message is not relevant; and

forwarding said priority message if the number of said forwarded priority messages received within said random duration is less than a specified number.

16. The method for vehicle to vehicle communication according to claim 13, wherein forwarding said priority message outside of said alert zone comprises:

receiving said forwarded priority message;

determining whether the receiving vehicle is within said motion-cast region for said leader vehicle;

pausing for a random duration and listening for other forwarded priority messages if said receiving vehicle is outside of said alert zone for said leader vehicle;

forwarding said forwarded priority message if the number of said forwarded priority messages received within said random duration is less than a specified number; and

dropping out of the forwarding procedure if said receiving vehicle is within said motion-cast region for said leader vehicle or if said number of said forwarded priority messages received within said random duration is greater than said specified number.

17. A system for vehicle to vehicle communication among a plurality of vehicles having wireless communication links, the system structured with a controller in each participating vehicle, comprising:

not less than one message receiver module, for receiving messages transmitted from other vehicles;

immediate follower management module, for receiving messages forwarded from said not less than one message receiver module and determines the location of a receiving vehicle relative to a sending vehicle;

emergency message generation module, for generating priority messages when an emergency event occurs;

relevancy decision module, for receiving messages from said message receiver module and determining whether said transmitting vehicle is a potential hazard to the receiving vehicle;

leader management module, for receiving messages from said message receiver module and determining whether a vehicle should continue broadcasting said priority message based on its leadership position;

forwarding monitor module, for receiving messages from said message receiver module and determining whether to forward said priority message;

emergency message broadcasting module, for broadcasting not less than one priority message when directed to broadcast said priority message by said leader management module;

forwarding broadcasting module, for broadcasting said forwarded priority message when directed to forward said priority message by said forwarding monitor module;

system clock module for periodically triggering the broadcast of regular driving messages;

regular driving message generation module for generating vehicle motion update information when triggered by said system clock; and

regular message broadcasting module for broadcasting said vehicle motion update information received from said regular driving message generation module.

18. The method for vehicle to vehicle communication according to claim 17, wherein said priority message broadcast by said emergency message broadcasting module receives high priority status.

19. The method for vehicle to vehicle communication according to claim 17, wherein said forwarded priority message broadcast by said forwarding message broadcasting module receives mid priority status.

20. The method for vehicle to vehicle communication according to claim 17, wherein said regular driving message broadcast by said regular message broadcasting module receives low priority status.

21. An article of manufacture comprising a computer usable medium having computer readable program code embodied in said medium which, when said program code is executed by said computer causes said computer to perform method steps for vehicle to vehicle communication among a plurality of vehicles having wireless communication links, comprising:

receiving notification of an emergency status, wherein said emergency status includes a sudden change in vehicle behavior;

broadcasting a priority message to surrounding vehicles within a transmission range if said notifying vehicle is in said emergency status;

determining whether said emergency status comprises an emergency event, wherein said emergency event includes creating a potential hazard to other vehicles;

discontinuing broadcasting of said priority message to said surrounding vehicles if said emergency status does not comprise an emergency event;

defining a repeat cycle, wherein said repeat cycle comprises the frequency with which said priority message is re-broadcast;

defining a maximum number of repetitions for said priority message;

pausing between each transmission of said priority message;

determining whether said maximum number of repetitions has been reached;

repeating broadcasting said priority message and pausing between each said transmission until said maximum number of repetitions has been reached; and

electing a leader vehicle, wherein said leader vehicle is the primary transmitting vehicle in a series of vehicles reacting to said emergency event.